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PHYSICS.—*"Physical" vs. "chemical" forces.* P. V. WELLS, Bureau of Standards. (Communicated by S. W. Stratton.)

In his remarkable memoir on the constitution of solids and liquids, Langmuir[1] considers in some detail those forces which are concerned in the structure of matter, stating their characteristics with great clearness. But unfortunately he adopts definitions of "physical" and "chemical" forces connoting a narrowness to the term "physical" which is quite unhappy. I realize, however, that his purpose in this is to emphasize the relation of many terms and phenomena usually regarded as distinct.

Science has arrived at a stage in its evolution where the classification between physics and chemistry appears artificial. Of course all classification is necessarily arbitrary and appears so especially at the boundaries between classes. There must, therefore, be confusion and difference of opinion among those who approach the study of what may perhaps be called *twin fields*, such as physical chemistry or chemical physics, from different points of view. The appropriate attitude in such matters seems to be to avoid the artificial issue by classification and nomenclature derived from a viewpoint common to both.

In view of the historical significance of the words "physical" and "chemical," their use in classifying forces appears rather unnatural. A less artificial nomenclature is that derived from the fundamental theory of the constitution of matter common

[1] I. LANGMUIR. Journ. Amer. Chem. Soc. 39: 1848. 1917.

to both physics and chemistry, according to which forces are classified as (1) *molar*,[2] (2) *molecular*, (3) *atomic*, and (4) *electronic*. There is little anthropomorphic in these words, and they center the attention on the phenomena. The classification is qualitative in the sense that no quantitative relations of these forces to energy have yet been defined. The electron theory of atomic structure, however, dispels much of the vagueness surrounding many of the forces, and raises into further prominence the conviction of Faraday that there is but one fundamental type of force.

Electronic forces may be defined as those which maintain the negative or valence electrons and the positive nucleus in equilibrium as a single system. Similarly, atomic forces may be defined as those which maintain two or more atoms in equilibrium as a single system; molecular forces as those which maintain two or more molecules in equilibrium as a single system; and molar forces those which maintain two or more masses in equilibrium as a single system. Each group of forces may be regarded as the residual fields of force remaining unsaturated in the smaller systems constituting the components of the system under consideration.

For the description of certain phenomena the molar theory is sufficient, but soon a stage is reached at which the phenomena must be considered in more detail. The system considered is then restricted to groups of molecules. This system is in its turn further restricted to atomic groups, and so on. The important point is that each theory includes all those preceding as special cases, as the result of simplifying approximations, or as arising from statistical considerations. The more closely one wishes to examine the nature of the extended system the more the point of view approaches that of the restricted system. The key to the nature of molecular forces, for example, is to be found in atomic considerations. This is the point particularly emphasized by Langmuir in his paper.

[2] *Molar* is derived from the Latin *moles*, a large mass. In the Century Dictionary *molar forces* are defined as those producing motions between large masses, *molecular forces* those between molecules, but which are insensible at sensible distance.

Whatever the nature of the fields of force, the effect of neighboring systems would be expected to be more definite the more discrete the structure. Thus electronic forces are definitely characteristic of the nature of the element, showing the finite differences of the periodic system. Atomic forces show more continuity, only two distinct types occurring, corresponding to primary and secondary valence. These may be called *primary* and *secondary* atomic forces. Molecular systems have lost so much of their discreteness that combinations of molecules do not follow the laws of definite and multiple proportions. In such phenomena as molecular association and surface structure, the discreteness of atomic constitution begins to give place to statistical continuity. Moreover, even in these phenomena, the forces are relatively so weak that molecules are not usually regarded as permanently grouped together.

In order to avoid the troublesome conflicts which are involved in the use of the words physics, physical chemistry, and chemistry, for many purposes it would be convenient to classify these portions of science into molar theory or *molics*, molecular theory or *moleculics*,[3] *atomics*, and *electronics*.

Molics deals only with continuous quantities and ideal discontinuities such as surfaces. This is the province of classical physics. In molecules the statistical nature of molar quantities must be considered. For instance, actual surfaces between distinct phases are not regarded as mathematical surfaces of discontinuity, but as possessing a molecular structure, so graphically shown by Langmuir and his predecessors. Such phenomena as molecular association, condensation and those connected with colloids and ions in gases are also typically molecular in that finite groups of molecules are involved and the range of forces is not large compared with the distances between molecules. Moleculics thus includes much of what is often called physical-chemistry. The complexity of molecular systems limits the application of quantitative methods, in spite of the great advances in statistical mechanics.

[3] The accent might be placed upon the penult, as in *monatomic*.

The great fertility of the atomic theory has produced such a mass of systematic knowledge that the province of atomics is easily defined. Moreover, the definiteness and comparative simplicity of atomic systems makes classification easy. This is still more striking in the case of electronics, which perhaps may be even more productive of systematic knowledge than atomics has been. To some, attention to nomenclature is considered trivial, but early in his career Faraday remarked the importance of clever definitions which he always recorded, and demonstrated by his example the close relation between the progress of science and its nomenclature. Moreover, if the main purpose of science is economy of thought, it is as necessary to systematize and classify facts already known, as to discover new facts only to have them buried unappreciated.

BOTANY.—*Notes on the genus Dahlia, with descriptions of two new species from Guatemala.* W. E. SAFFORD, Bureau of Plant Industry.

The impression that the many "double-flowered" dahlias of our gardens are forms created by modern horticulturalists from single-flowered types is erroneous. In the earliest illustration of plants belonging to this genus, made more than three centuries and a half ago, only double-flowered forms are represented. Indeed, the genus itself was based by Cavanilles on *Dahlia pinnata*, a plant with double heads identical in form with certain "peony-flowered" dahlias of modern catalogues. Francisco Hernandez, the *protomedico* of Philip II, sent by his sovereign in 1570 to New Spain to study its resources, figured at least three dahlias under the Aztec names *Acocotli*, *Cocoxochitl*, and *Acocoxochitl*, all of which are derived from *cocotli*, signifying, like the word "syringa," a hollow-stemmed plant; *acocotli* literally translated becoming "water-cane," or "water-pipe;" *cocoxochitl*, "cane-flower" or "hollow-stem flower": and *acocoxochitl*, "water-pipe-flower." It is interesting to note, in connection with this vernacular name, that it was also applied by the Aztecs to plants of distinct families, including umbellifers, one

of which, an aromatic Ligusticum with a hollow stem and fleshy roots resembling those of the genus Dahlia, was erroneously figured under the same heading as the two dahlias first described.

Fig. 1.—Duplex-flowered Dahlia, called Acocotli by the Aztecs. After Hernandez (1575).

Hernandez was not a botanist, but grouped his plants according to their uses and appearance, rather than to their botanical affinities.[1] Two of his figures, representing dahlias of the type

[1] In connection with the hollow-stemmed umbellifer of Mexico, it may be of interest to note that from the hollow stems of the allied Cicuta the shepherds of Virgil and Theocritus made pan-pipes, or syrinxes, "*disparibus septem compacta cicutis fistula.*"

now called "Duplex," with leaves like those of *Dahlia variabilis*, were poorly drawn (see fig. 1), but a third figure, reproduced in the accompanying illustration (fig. 2) was that of a Dahlia with

Fig. 2.—Peony-flowered Dahlia, called Acocoxochitl by the Aztecs. After Hernandez (1575).

flowers of the "peony type" and with leaves resembling those of *Dahlia glabrata*. This figure was accompanied in the Roman edition of Hernandez's work by a very brief and inadequate description. In the Madrid edition[2] it is described under the

[2] Vol. 1, p. 14, cap. 24.

heading "*De Acocoxochitl seu flore Acocotli*," as having flower heads with yellow disk and purple ray-florets, after which the author goes on to say that many more forms of Acocoxochitl occur in Mexico, differing from one another in the size and color of the flowers, some of them white, others yellow, others purple or red, others white tinged with purple, or perhaps yellow tinged with red, and a great many other kinds, in some cases with double or multiple whorls of ray flowers, either forming circles or clustered in compact bunches (*manipuli*). The roots he describes as fleshy, or succulent, and fascicled like those of asphodel, with a resinous or somewhat sweetish artichoke-like taste.

Although both the flowers and leaves of cultivated dahlias show considerable variation, yet there are certain features in both which are more or less uniform. In one group of the genus the ray-florets are broad and flat; in another they have a tendency to become involute or quilled, while in a third the margins are bent backward or revolute. These distinct groups are further characterized by their foliage, the leaves of which, whether simple, pinnate, or bipinnate, have a peculiar texture and vary similarly in form. Very little attention is paid to the leaf-characters of dahlias either in standard works on horticulture or in florists catalogues. A well defined species like *Dahlia coccinea*, for instance, may be found under the heading *leaves once pinnate*, in spite of the fact that in the original drawing of the type plant the lower leaves of this species have their lower pinnae again pinnate. In consequence of this carelessness and also perhaps from the fact that the lower leaves of the forms figured in catalogues are seldom shown, some authors have gone to the extent of uniting into a single species Cavanilles' *Dahlia pinnata*, *D. rosea*, and *D. coccinea*.

In nearly all the monographs on the genus Dahlia hitherto published the different varieties have been grouped from the horticulturalists' point of view, according to the forms of the flowers, under such headings as "single, duplex, anemone-flowered, collarette, pompon, fancy, decorative, peony-flowered, and cactus dahlias," without identifying the single-flowered forms with botanical species (except perhaps in *Dahlia coccinea* and

Dahlia imperialis) or attempting to connect the "duplex" and double forms with their primitive single ancestors. It is very probable that the types upon which several species have been based were hybrid plants. *Dahlia pinnata* itself, the type of the genus, was probably a hybrid. In the Index Kewensis its name is discarded as a synonym for the subsequently described *D. variabilis*. In the same way the handsome *Dahlia juarezii* with large double heads composed of strap-shaped florets having their edges turning backward, in sharp distinction to the involute or quilled florets of the artificial-looking "pompon dahlias" and the broad, flat-rayed heads of the "century" type of modern catalogues, is also to be regarded as a hybrid. Dahlias with flowers identical in form with the type of *Dahlia juarezii*, the ancestor from which the "cactus dahlias" of our gardens have sprung, are no longer called "cactus dahlias" by specialists, but "cactus hybrids." One of the ancestors of *Dahlia juarezii* must have been a single flowered species, with eight revolute ray-florets. Such a plant has recently been discovered in the mountains of Guatemala by Mr. Paul Popenoe, in honor of whom it is purposed to name the species described below. In addition to this species Mr. Popenoe brought back with him a handsome tree Dahlia, already represented in the U. S. National Herbarium, but hitherto erroneously referred to *Dahlia imperialis* by some authorities and by others to *Dahlia variabilis*. This second species represented in the herbarium by two sheets collected in Guatemala by Mr. William R. Maxon, is described below under the name *Dahlia maxonii*.

There are several other undescribed species of the genus Dahlia in the National Herbarium, but there is no space within the limits of this paper to describe them. Indeed the whole genus should be carefully revised by a botanist familiar with closely allied genera of composites and the work should be based upon material collected in the elevated regions of Mexico and Central America where the plants are endemic, not upon garden-grown specimens. Much of the material in herbariums is incomplete, owing to the absence of characteristic lower leaves of the plants represented; and many of the specimens are in

bad condition, owing both to the difficulty of drying succulent plants like dahlias, which wilt as soon as gathered, and to the injury of the flower heads by insects.

Dahlia popenovii Safford, sp. nov. *Tepeacocoxochitl* (Nahuatl); *Papalotl*, *Tunaita* (Guatemala).

A herbaceous plant about 1 meter high with fascicled, fleshy roots and slender, erect, hollow, striated, purplish stems glabrate near the base and sparsely clothed above with minute, whitish, woolly hairs. Leaves membranaceous, opposite with the bases of the petioles connate, as in the rest of the genus, the lower ones (lacking in the type) described as bipinnate; the upper ones simply pinnate, usually 3-foliolate, or simple and deeply 3-lobed, with the leaflets or lobes decurrent on the rachis and winged petiole, sparsely clothed with short, stiff hairs; leaf-like bracts of the inflorescence simple, laceolate, acuminate, sessile; leaves of young seedlings simple, broadly ovate, with the base decurrent on the slender petiole. Inflorescence more or less corymbose, with the flower heads borne on long slender, petioles, erect or slightly curved at anthesis, at length recurved or nodding; peduncles 12 to 14 cm. long bearing one or two bracts, sometimes with a shorter-peduncled head issuing from the axil of the bract. Flower heads 6 to 9.5 cm. broad, those of the type with bright scarlet or cardinal rays and yellow disks; outer involucre calyx-like, as in the rest of the genus, composed of 5 spreading or recurved spathulate-oblanceolate bracts; inner involucre composed of about 10 erect, diaphanous, oblong scales, rounded at the apex, enlarging after anthesis; ray florets 8, sterile, widely spreading, rounded and abruptly pointed at the tip, revolute or turning backward along the margins as in forms of the "cactus" type of cultivated dahlias; disk florets hermaphrodite, tubular; mature achenia 12 or 13 mm. long, concealed by the thin, diaphanous paleae borne on the disk, these resembling the scales of the inner involucre and almost equal to them in size.

Type in the U. S. National Herbarium, no. 1010584, collected near San Lucas, Department of Zacatepequez, Guatemala, at an approximate altitude of 6600 feet, October 21, 1916, by Wilson Popenoe (no. 682).

This handsome species, which is probably an ancestor of the hybrid *Dahlia juarezii*, from which the "Cactus Dahlias" of our gardens have been derived, is named in honor of its discoverer, Mr. Wilson Popenoe, of the Office of Foreign Seed and Plant Introduction. It is represented by a single specimen, and by several seedlings propagated at Yarrow, Maryland, from seeds collected by Mr. Popenoe. In Mr. Popenoe's field notes he writes as follows:

Antigua, Guatemala, October 23, 1916.—On my way back from Guatemala City to this place I collected some wild dahlias about 2 kms. above Santa Lucia, at an approximate elevation of 6600 feet, where the plants were most abundant. I have not seen them as low

Fig. 3.—*Dahlia popenovii*, showing two flower heads, mature fruiting head, upper leaves of mature plant and a single leaf of a young seedling; also a ripe achenium. Drawn from type material and from a photograph of the flower by Mrs. R. E. Gamble, Bureau of Plant Industry. All natural size.

as 5000 feet, but have found them up to 7000, which is as high as I have gone. I do not know how much higher they may occur. The plants observed near Santa Lucia grow to a height of about 4 feet. The stem is a dull greenish purple to purplish green, usually glabrous but sometimes with scattering hairs toward the upper portion. Leaves 2-pinnate near the base of the stem, 1-pinnate or simple above; leaflets of the lower leaves ovate acute, 2.5 inches long, 1.5 inches broad, remotely dentate, sparsely furnished with short bristly hairs, which are more scant beneath; rachis not exceeding 5 inches in length, often very short; petiolules 0 to 0.75 in. long. The flowers are 2 to 3.25 in. broad, with 8 ray florets, the latter sterile and orange brown or crimson in color, in some forms short and broad, in others long and narrow with the margins recurved or revolute, giving to the flower the appearance of a Cactus Dahlia, and contrasting with the other form having broadly spreading flat rays rounded at the tips.

From photographs of these contrasted forms it is evident that the latter species is the true *Dahlia coccinea* of Cavanilles, the type figure of which it exactly resembles.

Dahlia maxonii Safford, sp. nov. Tree Dahlia of Guatemala. *Tzoloj* (Kekchi); *Shikor* (Pokomchi); *Quauhacocoxochitl* (Nahuatl).

A tall plant with vertical terete hollow stem 3 to 5 meters high and 5 to 7 cm. thick, at length becoming woody, with joints at intervals formed by the clasping bases of the connate petioles of the opposite leaves. Leaves membranaceous, pale green beneath, deep green above, quite smooth or sparsely hairy, those of the inflorescence and on the upper part of the stem simple or pinnate, those on the lower portion of the stem bipinnate; leaflets lanceolate, terminating in a long slender point, the terminal leaflet narrowed and the lateral ones rounded and unequal at the base, with the blades more or less decurrent on the narrowly winged rachis, the margins dentate (the larger leaflets with 16 to 18 teeth on each side), the lower pair often bilobed and sometimes with an additional pair of small leaflets at the base, as in several other species of the genus; leaves of young seedlings simply pinnate, with the rachis scarcely or not at all winged. Flower heads peduncled, erect; peduncles 10 to 12 cm. long, those of axillary heads somewhat shorter and subtended at the base by simple caudate-acuminate leaf-like bracts narrowed at the base into a winged petiole 1 or 2 cm. long; involucre composed of two distinct series, the outer consisting of 5 green, fleshy, widely spreading, spathulate-ovate bracts obtuse at the apex 10 to 15 mm. long and 5 to 8 mm. broad, the inner of about 10 membranaceous diaphanous, oblong, scales rounded at the apex, overlapping before anthesis, at length erect, 18 to 20 mm. long and 8 to 10 mm. broad. Ray florets neutral, lavender-pinkish or lilac, ovate, flat, widely spreading as in the cultivated forms of the "century type," 4 to 5 cm. long and 2 to 3 cm. broad with the apex rounded or abruptly pointed; disk-florets hermaphrodite, often sterile, tubular,

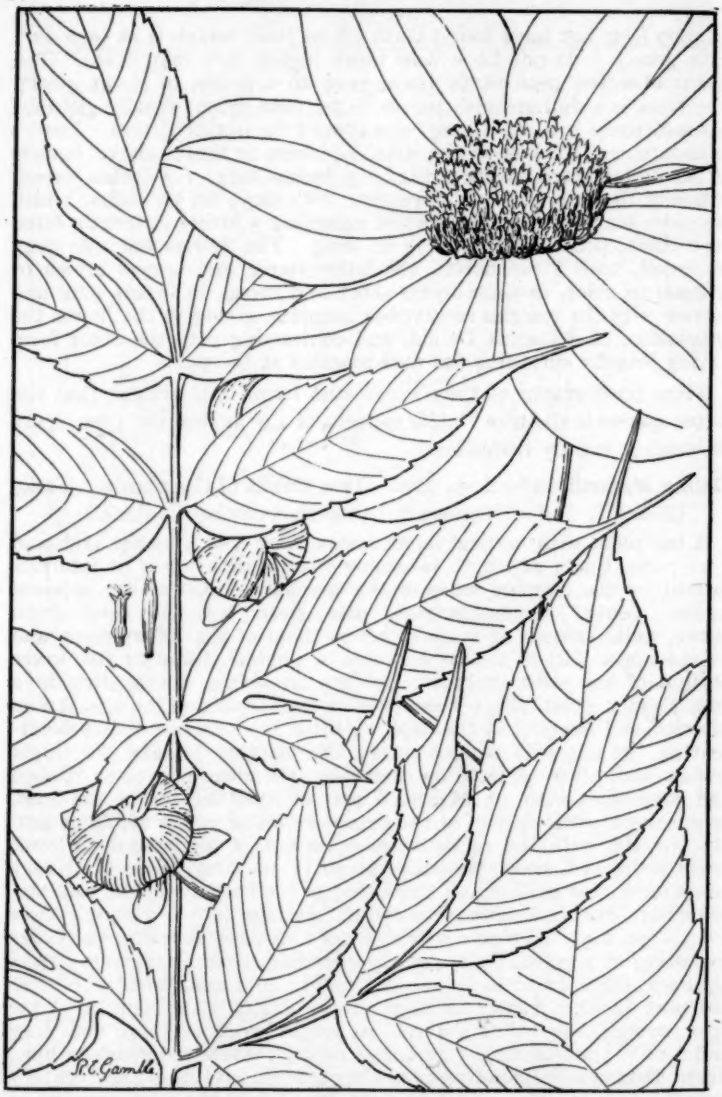

Fig. 4.—*Dahlia maxonii*, showing fully expanded flower, two unopened buds, disk floret, and achenium, together with a bipinnate and a simple leaf. Natural size. Drawn by Mrs. R. E. Gamble.

sharply 5-toothed, yellow, 10 mm. long; mature achenia, 1.5 mm. long.

Type in the U. S National Herbarium, no. 473271, collected at Socoyocté, Department of Alta Verapaz, Guatemala, January 16, 1905, by William R. Maxon (no. 3295).

DISTRIBUTION: Mountains of Alta Verapaz, Guatemala, and across the boundary into the state of Chiapas, Mexico.

This handsome tree dahlia is named in honor of Mr. William R. Maxon, collector of the type material. It is further represented in the U. S. National Herbarium by specimens from Sepacuité, Alta Verapaz, collected by George P. Goll (no. 224), Guatemala, without definite locality, by Heyde (no. 319) and Mrs. William Owen (no. 2a "Tzoloj"); in cultivation near Guatemala City by Wilson Popenoe (no. 728); and in the vicinity of San Cristobal, state of Chiapas, Mexico, at an elevation of 7000 to 8800 feet, by E. W. Nelson (no. 3173).

In Mr. Maxon's field notes he describes it as a plant "8 to 15 feet high; flowers lavender-pinkish, 4 inches across; buds and young shoots eaten as 'greens;' a very common plant." Mr. Popenoe's notes, dated Tactic, Alta Verapaz, Guatemala, December 16, 1916, are as follows:

"This tree dahlia is extensively used here for hedges. The stems are cut and inserted in the ground, projecting three or four feet; they take root and grow, and when the plants have reached ten or twelve feet in height they produce quantities of lilac-pink flowers, three to five inches broad. Just now they are in all their glory, and Tactic is brilliant with them. This impresses me as being an unusually fine decorative plant. It should be cultivated in the United States. In addition to the typical form, — single pink, — three others are known in this region. Some of them may be distinct species. The people say they are wild plants. One resembles the typical form except that it is quite double. Another is a single white, its flowers resembling those of the single pink in everything except color. The fourth form is double white. The flowers of this form are very handsome and are used by the Indians to adorn the images of saints which they keep in their houses. Don Matias Acevedo says that water contained in the hollow stems is medicinal. It is used here as a gargle in cases of sore throat. This plant is called *shikor* in Pokomchi, which is the language spoken in Tactic. In Kekchi, which is the language spoken throughout most of the Alta Verapaz, the name is *tzoloj*."

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. The abstracts should conform in length and general style to those appearing in this issue.

BIOLOGY.—*A sketch of the natural history of the District of Columbia, together with an indexed edition of the U. S. Geological Survey's 1917 map of Washington and vicinity.* W. L. McATEE. Bull. Biol. Soc. Washington 1: 1–142, maps 5. 1918.

The purposes of this publication are to present a brief biological history of the District of Columbia, to point out the best places for field work, and to supply geographical assistance. The earliest observation on the natural history of the region was made by Captain John Smith in the year 1608, who reported several kinds of mammals from this region, particularly bears and deer. The first information regarding the botany is furnished by Petiver, who in 1698 published some notes on plants sent him from Maryland. The first formal list of the plants of the District of Columbia was published in 1816, and from the 142 species then credited to this region, the list has increased until at the present time there are approximately 1600 species known from the vicinity of Washington.

Insects, of course, are more numerous here than any other group of animals, and beetles alone number 3000. Several hundred species, chiefly Diptera and Hymenoptera, have been described from material collected near Washington. Of other invertebrates there are known from the District of Columbia, 90 species of mollusks, 308 species of spiders, 10 phalangids, and 246 rotifers. Among the vertebrates, fishes have received more attention than any other group except birds, and there are now 94 species recorded from this region, several of which were described from local specimens. Owing to the presence of tide-water, a number of salt-water fishes are found there. Of batrachians there are 27 species, and of reptiles, 36. The birds of the District have been more carefully studied than any other group of vertebrates, and there is now a list of some 300 species and subspecies. Of mammals there are 41 species, 3 of which were originally described from specimens obtained near Washington. It is of interest to note that within historic times, the buffalo, elk, and puma were to be found near what is now

the City of Washington. The Indians of Algonquina stock who inhabited this region, all abandoned it about the year 1700.

The Fall Line, separating the Piedmont Plateau from the Coastal Plain, runs through the District of Columbia and acts as a more or less definite faunal barrier, most so in the case of plants and insects. Another interesting feature of this region is the numerous magnolia bogs and their relation to the pine barrens of New Jersey. Careful study of these bogs has shown that they possess a large percentage of the characteristic pine-barren plants, and that they now harbor these survivors of the plant waves that accompanied the successive depressions of the Atlantic Coast region. Furthermore, the absence of pine barrens from the District of Columbia is due only to the absence of extensive areas of suitable soil deposits. Other types of collecting ground about Washington, with mention of localities where such are to be found, together with some of the more desirable plants and animals to be obtained at each, are also given. One of the chief features of this bulletin is an indexed edition of the recent United States Geological Survey map of the District of Columbia and vicinity, to which a detailed index furnishes a ready means of reference. All the old collecting spots, archaeological sites, and the minor topographical details, are indicated, and it is thus possible to locate any place of biological or other interest in this region. HARRY C. OBERHOLSER.

GEOGRAPHY.—*The Canning River region, northern Alaska.* ERNEST DE K. LEFFINGWELL. U. S. Geol. Survey Prof. Paper No. 109. Pp. 245. Pls. 35, figs. 33. 1919.

The report deals chiefly with the geography and geology of an area about 70 miles square south of Camden Bay on the Arctic coast of Alaska. In addition it gives facts and interpretations relating to many problems in other fields of science.

Under geography are described the Franklin mountains, Romanzof mountains, and some other parts of the Arctic mountain system. North of the mountains is the Anaktuvuk Plateau, a rolling tundra upland that slopes gradually seaward. The flat and almost featureless coastal plain rises very gradually from the Arctic Ocean southward to the Anaktuvuk Plateau. The coast line is generally straight and the land very low. The shore is characterized by low mud banks, shallow lagoons, sand spits, islands, and mud flats. Maps accompanying the reports present the first accurate chart of the north Arctic coast of Alaska from Martins Point to Colville River. In the mountains the

rivers flow through marked glacial troughs; in the upland through wide valleys; and in the costal plain nearly at the surface of the tundra. Canning River is 120 miles long; other large streams of the area are the Okpilak, Hulahula, and Sadlerochit.

Under Geology are described: Paleozoic, Mesozoic and Cenozoic rocks. Pleistocene glaciers extended from the mountains well down the valleys but did not reach the coast. Present glaciers are confined to the higher mountain valleys.

The occurrence of ground ice is described and the literature of this subject reviewed in considerable detail. The author concludes that the two varieties of ground ice most common in northern Alaska are formed by the burial of river ice by sediments, and the growth in place of vertical ice wedges. J. T. PARDEE.

MYCOLOGY.—*Further data on the susceptibility of rutaceous plants to citrus-canker.* H. ATHERTON LEE. Journ. Agr. Res. **15**: 661–665. 1918.

Inoculation tests made in the Philippine Islands with *Pseudominas citri* upon 24 species representing 20 genera of the family Rutaceae, show that 19 of the species are susceptible in greater or less degree. It thus appears that citrus-canker is not closely limited to the genus Citrus, but has a wide range of hosts among the Rutaceae.

Severinia buxifolia, *Aegle marmelos*, and *Balsamocitrus gabonensis* all close relatives of Citrus, may safely be called immune to citrus canker. *Xanthoxylum rhetsa* and *Triphasia trifolia* seem to be immune.

Chalcas (*Murraya*) *exotica*, *Atalantia disticha*, and *Fortunella* (*Citrus*) *japonica*, also closely related to the genus Citrus, are strongly resistant to citrus-canker.

Claucena lansium, *Feronia limonia*, *Feroniella lucida*, *Chaetospermum glutinosum*, *Hesperethusa crenulata*, *Paramignya longipedunculata*, *Citropsis schweinfurthii*, *Atlantia citrioides*, *Eremocitrus glauca*, *Fortunella hindsii*, *Microcitrus australis*, *M. australasica*, *Toddalia asiatica*, *Evodia ridleyei*, *E. latifolia*, and *Melicope triphylla*, of different relationships to the genus Citrus, all produce positive results when inoculated with *Pseudomonas citri*, at needle punctures. Of these, *Claucena lansium* and *Feronia limonia* develop infection very slowly, the others fairly quickly.

Chaetospermum glutinosa shows naturally occurring infections of citrus-canker and in the Philippines its susceptibility is easily greater than that of the sweet orange (*Citrus sinensis*). *Fortunella hindsii*

occurs naturally in South China, very much isolated from sources of citrus-canker infection. The abundance of cankers found on such trees gives rise to the theory that this species may have been an original wild host from which citrus-canker spread to cultivated species.

H. R. FULTON.

MYCOLOGY.—*The parasitism, morphology, and cytology of* Cronartium ribicola *Fischer.* REGINALD H. COLLEY. Journ. Agr. Res. **15:** 619–659. Pls. 48–53. December 23, 1918.

In the white pine the mycelium of the fungus makes its way between the cells of the phloem tissue, passes into the xylem along the rays, and in some instances works its way between tracheids. The severe damage to the tree attacked results from the driving out of the bark after formation of the aecia and a consequent girdling action. Before spore formation, the pine cells are quite tolerant of the presence of the hyphae of the parasite. The mycelium in Ribes leaves is scattered; haustoria are much less prominent and abundant than on the mycelium in the pine host. The damage to Ribes varies greatly according to the susceptibility of the species.

Pycnia are formed in broad layers just under the outer cork layers of the bark. The aecia, more deeply seated than the pycnia, are formed on the same general area as the pycnia, following the latter by one season. The aecial peridium is three to five cells thick. Uredinia are formed on the lower surface of the infected Ribes leaves, and are at first covered by a peridium one cell in thickness. The teliospores are produced in columns which in their young stages are identical with the young stages of the uredinia, having the same type of peridium. Every teliospore in the column may germinate.

The cytological processes agree very closely with those observed by previous investigators on other rusts. At the inception of the dikaryon at the base of the aecium, the union of two fertile cells regularly occurs, but a number of cases were observed where several cells formed a large placenta-like unit from which the aeciospore chains appeared to arise. The similarity of the processes of conjugate division in the dikaryon in the aecia, uredinia, and telia, suggests a stability of nuclear material throughout the dikaryon. The presence of centrosomes in the nuclei, and occurrence of a number of chromesomes in excess of two, is discussed and illustrated very fully. R. H. C.

MYCOLOGY.—*Physoderma disease of corn.* W. H. TISDALE. Journ. Agr. Res. **16:** 137–154. 1919.

The Physoderma disease of corn, which was discovered by Shaw in India in 1910 and by Barrett in the State of Illinois in 1911, is now known to be more or less prevalent throughout the United States as far westward as central Texas and Nebraska, and northward to southern Minnesota and New Jersey. It causes little damage except in the South Atlantic and Gulf Coast States and in the lower Mississippi Valley, where there is considerable rainfall accompanied by high temperatures. In these localities there may be as much as 10 per cent loss of grain.

At a distance the disease has the appearance of a true rust, but on close observation the two can be easily distinguished. The small reddish-brown spots on the blades, which are seldom more than 1 mm. in diameter, often coalesce to give the blade a rusty appearance. On the midrib, sheath, and culm, the spots are often as much as 5 mm. in diameter and may be almost black, due to the abundant production of dark brown sporangia in the tissues. The parenchyma tissues of the sheath may be entirely destroyed, leaving nothing but a shredlike mass of vascular fibers in the later stages. Plants have been seen to break over before maturity, due to a girdling of the lower nodes by the fungus.

The invaded cells are filled with dark brown zoosporangia, which live over winter in the old diseased plants and in the soil. These sporangia are carried by wind and spattering water to the young plants the following season, where they are lodged behind the sheaths and in the buds. With sufficient free water and a high temperature (23° to 30° C.) they germinate by producing numerous uniciliate zoospores which come to rest in from one to two hours and germinate by threadlike hyphae which penetrate the epidermis of the host, invade a number of cells, and produce within them a large number of sporangia which make the disease evident.

The most probable means of control are careful sanitation and crop rotation. W. H. T.

MYCOLOGY.—*Apple scald.* CHARLES BROOKS, J. S. COOLEY, and D. F. FISHER. Journ. Agr. Res. 16:195–217. 1919.

Apple scald is a transportation and storage disease of apples. Green apples are more susceptible to the disease than mature ones, and apples from heavily irrigated trees more susceptible than those from trees receiving more moderate irrigation. The rapidity of the development of the disease increases with a rise in temperature up to 15° or 20° C.

Stirring the storage air has been found entirely to prevent the development of scald. Thorough aeration during the first eight weeks of storage was found more valuable than later ones. Apples packed in boxes or ventilated barrels have scalded less than those in tight barrels, especially when the storage room received an occasional ventilation. Ordinary apple wrappers have had no effect on apple scald, and paraffin wrappers but little, but wrappers soaked in various oils and fats have entirely prevented the disease. Accumulations of carbon dioxide (1 to 6 per cent) have not favored the development of scald but tended to prevent it. The experimental results indicate that apple scald is due to volatile or gaseous substances other than carbon dioxide which are produced by the apples themselves. They can be carried away by air currents or taken up by various absorbents. C. B.

PHYTOCHEMISTRY.—*The distribution and characters of some of the odorous principles of plants.*[1] FREDERICK B. POWER. Journ. Ind. Eng. Chem. 11: 344–352. April, 1919.

In this paper, which does not permit of a comprehensive abstract, the author indicates the chemical characters of the great variety of compounds to which the odor of plants is due, the distribution of these compounds among the different plants, and the methods by which they are obtained. Among the *cryptogamous* or flowerless plants, such as the algae, fungi, lichens, and ferns, there are very few which possess any marked or distinctive odor, whereas the *phanerogamous* or flowering plants contain such an exceedingly large number of odorous substances as to preclude a complete enumeration of them. These substances, many of which have been the subject of extended chemical study, are of such a diverse character as to include representatives of practically all the principal groups of organic compounds, comprising, for example, the hydrocarbons, alcohols, aldehydes, ketones, phenols and phenol ethers, acids, esters, and lactones. The odorous products of the plant are generally obtained by a process of steam distillation, and are then commonly known as essential oils or volatile oils, most of which are more or less complex mixtures, although frequently one constituent of them may largely predominate. Some of the essential oils are obtained by expression, such as those of the citrus fruits, notably the orange, lemon, and bergamot. In some cases the odorous principles of plants

[1] Abstract of an address of the retiring president of the Chemical Society of Washington. Delivered before a joint meeting of the Chemical Society and the Washington Academy of Sciences, January 9, 1919.

are of so delicate a nature that they can only be obtained in a tangible form by a process of maceration with a purified fat, known as *enfleurage*, whereby the perfume is absorbed and may subsequently be extracted with alcohol. As examples of this class there may be mentioned the flowers of the violet, jasmine, tuberose, jonquil, lily of the valley, and mignonette.

The various families of plants which have been considered by the author for the purpose of illustration include the *Coniferae, Gramineae, Palmae, Liliaceae, Iridaceae, Zingiberaceae, Orchidaceae, Aristolochiaceae, Annonaceae, Myristicaceae, Lauraceae, Cruciferae, Rosaceae, Geraniaceae, Myrtaceae, Umbelliferae, Ericaceae, Labiatae, and Compositae.* In connection with these groups numerous volatile products have been described with reference to the chemical character of their individual constituents. The preparation by synthetic methods of some of the odorous substances which occur in nature, or of compounds related to them which are largely used in perfumery, has also received consideration. F. B. P.

SPECTROPHOTOMETRY.—*The ultra-violet and visible transmission of eye-protective glasses.* K. S. GIBSON and H. J. MCNICHOLAS. Bur. Stand. Tech. Paper No. 119. Pp. 47. 1919.

Many glasses are on the market and extensively advertised to protect the eyes from injurious radiant energy. Unfortunately, but little authoritative information concerning the properties of these glasses has been available. The public and even oculists and physicians have had little to guide them in selecting such glasses except the claims of makers and agents. One purpose of such glasses is to absorb the injurious radiant energy which is emitted along with the light from certain lamps, as well as from welding arcs and industrial furnaces, while transmitting sufficient light for vision. They thus act as filters. Another purpose in certain cases may be to absorb part of the light so as to reduce a blinding brilliance. Glasses of different types are required for different needs. The degree to which these glasses actually fulfill their avowed purpose can only be determined by measurements of their "transmission" (*i. e.*, the ratio of transmitted energy to the energy falling on them) for the various forms of radiant energy in question. This paper gives the results of such measurements made on a great number of glasses now on the American market. A suggested specification for eye-protective glasses is given. K. S. G.

TECHNOLOGY.—*Silica refractories. Factors affecting their quality and methods of testing the raw materials and finished ware.* DONALD W. ROSS. Bur. Stand. Tech. Paper No. 116. Pp. 84. 1919.

The quartz or amorphous silica of raw silica brick is gradually transformed to crystal forms of lower specific gravity when the bricks are burned during manufacture, and when subsequently heated in use. Dr. C. N. Fenner, of the Geophysical Laboratory of the Carnegie Institution, laid the foundations for the study of the silica refractories by working out the physico-chemical properties of the silica minerals. Mr. Spotts McDowell applied the results of this work in a study of the permanent, crystal changes taking place in silica refractories on being heated to temperatures usually attained in manufacture. He also studied the effect of such changes on the strength of the brick, and its tendency to spall (fly apart) when rapidly heated or cooled.

The writer took up the work at this point, in the hope of obtaining some practical applications. He has studied the changes in volume, porosity, and true specific gravity of most of the leading commercial brands of silica brick, and of the raw materials from which they are made, in conjunction with the crystal changes. The volume, porosity, and specific-gravity changes were obtained by computation from the dry weight of a piece, its weight when saturated with water, and its weight when suspended in water.

The porosities of the quartzites in conjunction with their appearance under the microscope, indicate that impervious, highly metamorphosed quartzites, having tightly interlocking grains, are more apt to be suitable for the manufacture of silica brick than porous quartzites which have rounded grains. The changes taking place on heating indicate that the best bricks would be produced in manufacture by an extended heating between 1250° C. and 1350° C. and a final gradual rise to higher temperatures. From the studies on commercial brick, it has been determined that the true specific gravity of a silica brick is a direct measure of the degree to which the brick has been burned, and in conjunction with the porosity, indicates approximately what the subsequent expansion of the brick in use will be. Thus, by a simple procedure, the manufacturer can keep an accurate check on the nature of the silica brick he is turning out, and in the same way the consumer can determine what to expect from them in use. D. W. R.

PROCEEDINGS OF THE ACADEMY AND AFFILATED SOCIETIES

GEOLOGICAL SOCIETY OF WASHINGTON

The 334th meeting of the Society was held in the Auditorium of the Cosmos Club on Wednesday evening, April 9, 1919, at 8.00 p. m.

PROGRAM

C. E. VAN OSTRAND: *Temperatures in some deep wells in the United States.*

During the past few years observations of temperature have been made in deep wells located in Texas, Oklahoma, Pennsylvania and West Virginia. The apparatus used in making the tests was capable of an accuracy of about 0.2 or 0.3° F. for depths of about 4000 feet, while for greater depths the error may have risen in a few instances to 0.5° F.

The depth temperature curves, instead of being a straight line, as would be expected from cosmological hypotheses, are generally curves with a marked convexity toward the axis of depth. In the case of the Goff Well, for example, the rate of temperature increase varies continuously from 1° F. in 97.5 feet at the surface, to 1° F. in 46.5 feet over the interval, 6000 to 7000 feet.

Temperatures at the same depth in the Texas and Oklahoma fields, differ widely from those in Pennsylvania and West Virginia. The temperature of the oil in two wells near Mannington, West Vriginia, is 83.2° F. at a depth of about 2900 feet. No record of oil temperature was obtained in the Southwestern fields but an extension to a depth of 3400 feet of the depth temperature curves of five wells in the vicinity of Ranger, Texas, indicates that the temperature of the oil in the rocks is about 135° F. The average rate of temperature increase at the surface for thirteen wells in Texas and Oklahoma, is 1° F. in 51.5 ± 0.8 feet; the same for twelve wells in Pennsylvania and West Virignia is 1° F. in 91.5 ± 1.2 feet.

E. W. BERRY: *Present tendencies in paleontology.*—It is difficult to get into a sufficiently detached frame of mind correctly to visualize the true position of the United States in the present status of paleontology. We undoubtedly exhibit a provincialism and a radicalism that goes with young nations as with young individuals. The future belongs to us if we keep our ideals high enough. The paleontologic sun is setting in Europe while the dawn is just breaking in America.

Progress in paleontology can only result from the action and reaction of the two parallel lines of human endeavor, namely, the accumulation of facts through exploration, research, and discovery, and the eluci-

dation of the accumulated facts through advances in philosophic interpretation. The accumulation of facts usually far outruns their interpretation. Stratigraphic paleontology cannot be divorced from biological paleontology without becoming sterile. Hisotorical geology is the idea we strive for. Loosely drawn genera and species are no longer useful. Progress depends on research. True research does not depend on subject matter but on method. I would wish to depreciate the tendency, rampant throughout the world, to seek a justification for research as a means towards some economic end. If the elucidation of each history and the origin and evolution of life on the globe are not of prime importance as ends in themselves; if the whence, and the why, and the whither are not supreme, then indeed has our lot fallen among evil days. I venture to hope that research will increase in both quality and amount, and that the day will speedily arrive when a first rate paleontologist can command a fair income in the successful practice of his profession.

E. T. WHERRY: *Some practical applications of crystallography.*—This paper comprised illustrations of the application of petrographic methods to certain chemical problems, including the identification in foods of crystalline substances, such as magnesium ammonium phosphate which had been mistaken for glass; the control of the manufacture of explosives and dyes by optical study of their crystals; and the recognition of the nature of a peculiar type of crystallization in honey. It was illustrated by lantern slides made from photomicrographs.

The 335th meeting of the Society was held in the Auditorium of the Cosmos Club on Wednesday, April 23, 1919, at 8.00 P. M.

PROGRAM

G. W. STOSE: *Manganese deposits of the Appalachian Valley of Virginia and Tennessee.*—The manganese deposits of the Appalachian Valley lie chiefly along its eastern border, but some occur within the open valley, and others among the ridges on the western side. The deposits are chiefly replacement deposits in clay and sand residual from disintegrated limestone and calcareous sandstone, and 10 different modes of occurrence have been observed. Eight of these are associated with specific, geologic horizons, which range from earliest Cambrian to the Carboniferous. Other deposits are along fault planes and in terraced stream gravels. Only 1 of the deposits is a carbonate ore, which replaces dolomite and slate.

The conclusions reached are that: 1, the localization of the deposits at certain horizons, is due to their derivation from certain sedimentary beds which were somewhat richer in manganese than sediments generally; 2, these richer zones occur at the base of formations and some are associated with glauconite, phosphate, eolean sand grains, and other detritus accompanying land waste at unconformities; 3, the original mineral was probably a carbonate of manganese, calcium, and iron; 4, the ores were concentrated by the solution of the original disseminated mineral, by meteoric waters, and redeposition in porous

layers or channels, replacing the sand and clay of the rock; 5, this concentration was favored by periods of long denudation and deep weathering and was therefore most extensive on old peneplain surfaces; 6, the purity of the ore is controlled largely by the purity of the rock replaced; 7, some of the richer minerals were apparently derived from other minerals by dehydration after deposition, and some psilomelane appears to have been deposited with quartz while it was in a gelatinous state; 8, only one of the deposits, which passes downward into carbonate ore, was a replacement of the bedrock below the zone of surface weathering.

H. D. MISER: *Manganese deposits of the Batesville district, Arkansas.*—The manganese ores consist of oxides and generally occur in irregular shaped masses from less than one pound to 22 tons in weight, with rough surfaces. Most of the masses are in clay; the others are in limestone, shale, chert, and sandstone, and there is much evidence that the manganese oxides of which the masses are composed have replaced all of these inclosing materials. The oxides have been derived from manganese-bearing carbonates near the surface and do not extend below the permanent water level of the district. The workable deposits occur in the nearly horizontal Fernvale limestone and Cason shale of Ordovician age and in residual clays which were mainly derived from these two formations. Most of the masses in the clays are residual, having been freed from the above-named formations by their decomposition; the others have been formed by the replacement of the clays by manganese oxides.

The Cason shale was laid down in shallow marine waters on an old land surface and was probably the source of all of the manganese. The manganese was apparently deposited as a carbonate in the shale, and since then there have been two principal periods of reconcentration, the first taking place during one or more of several stages of emergence and erosion that occurred between the Ordovician and Carboniferous periods, and the other about the time of the completion of the Upper Cretaceous or early Tertiary peneplain whose approximate elevation is marked by many of the even-crested hills of the district. During both periods the manganese was concentrated in the Cason shale and much of it was carried in solution from the shale down into the Fernvale limestone. Synclines were present during the earlier period, as well as the last one, and they probably offered favorable conditions for the concentration of the manganese ores, as is shown by the fact that most of the ores occur in synclines.

E. L. JONES, JR.: *Manganese deposits of the Colorado River Desert Region.*—Deposits of manganese ore have been recently exploited in the desert region adjacent to Colorado River, that extends from the Big Bend near Las Vegas, Nevada, to Yuma, Arizona.

The deposits are fillings in veins and brecciated zones and replacement deposits. The veins and brecciated zones cut all the rocks of

the region ranging from schist and granite of pre-Cambrian age to basalt and conglomerate of Quaternary age, and the replacement deposits are in sandstone and tuff beds of Tertiary age. The ores consist of the oxides psilomelane, pyrolusite, manganite, and wad. Calcite generally accompanies the manganese oxides, and iron oxides, barites, and gypsum occur in some of the deposits. Quartz does not occur except as a constituent of rock fragments inclosed in the veins and as unreplaced grains of the sandstone. The source of the manganese oxides is obscure but in some of the deposits the manganese oxides are believed to have been derived from the decomposition of manganiferous minerals in overlying rocks and deposits by meteoric waters. In other deposits the ore bodies may be residual from manganiferous calcite deposited by rising hot solutions in the fissures.

J. T. PARDEE: *Manganese deposits of the Northwestern States.*—At Butte, Montana, lodes formed along steeply pitching fractures in granite are characterized by manganese minerals in a zone peripheral to the central copper zone. The arrangement of these zones suggests a central deep source from which the metals were carried upward and outward. Rhodochrosite, the carbonate of manganese, forms workable bodies from which more than 60,000 tons of ore were mined in 1918. At Philipsburg, Montana, lodes cut Paleozoic limestone and intrusive granite. In the limestone near the granite, large irregular chambers filled with manganese oxides are found along the lodes. During 1918 and 1919 they yielded more than 200,000 tons of high grade ore. The manganese oxides are derived from the oxidation of rhodochrosite which was introduced during a late phase of the lode mineralization. Small deposits of the same origin as those at Butte and Philipsburg occur in the Tintic and Erickson districts, Utah; the Siegel and Ely districts, Nevada; Pleasant Valley, Oregon; and Omak, Washington.

Deposits at several other places belong to a class whose manganese was derived from more or less disseminated or obscure sources. The extensive deposits in the Olympic mountains of Washington are possibly of sedimentary origin though they have been greatly modified by regional metamorphism. The deposits near Green River, Utah, were concentrated during the weathering of a manganese-bearing limestone bed in the McElmo formation.

E. F. BURCHARD: *Managanese-ore deposits of Cuba.*—Manganese ore is found in Cuba, in Oriente, Santa Clara, and Pinar del Rio Provinces, but in Oriente Province only does it occur in large commercial quantities. In Oriente the important deposits are in two areas, one north of Santiago de Cuba, the other south of Bayamo.

The manganese ore of Oriente occurs in proximity to areas of volcanic rock, but the deposits of the other two provinces, which are small and unimportant, are remote from volcanic areas. The ore is found in the oxidized zone, mainly near the surface, but in places extends be low groundwater level. The deposits are in sedimentary rocks of

upper Eocene age, such as foraminiferal limestone, shaly, glauconitic sandstone, conglomerate, and waterlaid andesitic tuff, and in igneous rocks such as latite-porphyry and latite. Eocene time was characterized in the area of Oriente Province chiefly by subsidence, with active volcanoes, causing interbedding of volcanic and sedimentary rock.

The ore consists of some or all of the oxides pyrolusite, psilomelane, manganite, and wad, and braunite has been noted, but as a rule the individual minerals are not readily distinguished. The deposits are of three general types according to their associations: deposits in bedded rocks, deposits in irregular siliceous masses (jasper, bayate) that occupy openings in both sedimentary and igneous rock, and deposits of nodules and fragments in clay. The "bedded" deposits comprise several varieties, one of the most common having been formed by partial replacement by manganese oxides of portions of tuff beds, and consisting of poorly consolidated, tuffaceous material, granules of pink clay, zeolites, and manganese oxides. Other bedded deposits are replacements of limestone, sandstone, and conglomerate, and a fossil bog was noted.

The proximtity of volcanic rocks to the manganese-bearing areas, and the broader structural relations, suggest the possibility that the manganese was derived from volcanic rocks of the Sierra Maestra Mountains, transported by artesian waters, together with silica and deposited in the porous tuff strata and as masses of manganiferous jasper in joints and fissures in the limestone and glauconitic sandstone. The jasper and bedded tuff, in weathering, have contributed the manganese that is now found in the other rocks and in detrital deposits.

D. F. HEWETT: *Summary.*—Most manganese deposits offer two rather distinct problems: (1) that which is concerned with the features, source, manner of deposition, and distribution of certain primary minerals, only a few of which are useful in the arts, and (2) that which is concerned with the features, source, manner of deposition, and distribution of certain secondary oxide minerals which are derived from the primary minerals and are highly useful.

Recent work shows, although the common primary manganese minerals, such as carbonates, silicates, and sulphides are widely found in deposits that are associated with igneous intrusions, there are a number of poorly defined manganiferous carbonates and silicates that are laid down with sediments. In some places these minerals form concretions in the sediments but elsewhere they appear to be uniformly distributed in thin zones.

Although the higher oxides and hydrous oxides of manganese appear to be deposited in the belt of weathering only, the lower oxides are apparently deposited under conditions found below the belt of weathering, or may be formed when the higher oxides are affected by regional metamorphism.

Large bodies of the higher oxides and hydrous oxides of manganese, accumulate near localized bodies of carbonates and silicates when these are thoroughly weathered. In several regions, however, the occurrence of many manganese oxide deposits on the remnants of old erosion surfaces where the nearby sedimentary rocks are deeply weathered and the sources of the manganese are consequently obscure, indicates that under conditions of peneplanation there is an opportunity to accommodate in small areas the manganese that was formerly widely disseminated through the rocks.

R. W. STONE, *Secretary.*

SCIENTIFIC NOTES AND NEWS

INTERNATIONAL SCIENTIFIC ORGANIZATIONS

A meeting to organize an International Research Council is being held at Brussels beginning July 18, 1919. Delegates will be present from the National Research Council of this country, and from similar organizations in the various countries which have been associated with the United States during the recent war. The question of the admission of neutral countries will be brought before the meeting. Countries which have not organized a research council will be represented by delegates from their national academies.

The delegates from the United States of America are: W. W. CAMPBELL, *Chairman*, Chairman of American Delegation, International Astronomical Union; H. M. HOWE, Scientific Attaché at Paris, also representing Engineering; C. E. MENDENHALL, Scientific Attaché at London, also representing Physics; H. S. WASHINGTON, Scientific Attaché at Rome, also representing Geology; WM. BOWIE, Chairman of American Delegation, International Geophysical Union; E. W. WASHBURN, Chairman of American Delegation, International Chemical Union; W. S. THAYER, representing Medicine; JOHN C. PENNY, representing Patents; D. W. JOHNSON, representing Geography; H. F. MOORE, representing Biology and Fisheries.

A meeting to organize an International Chemical Union was held in London on July 15. The American delegates to this meeting were: E. W. WASHBURN, *Chairman*; EDWARD BARTOW, F. G. COTTRELL, CHAS. L. PARSONS, JULIUS STIEGLITZ, H. S. WASHINGTON; Alternates: A. B. LAMB and JAS. F. NORRIS.

An International Astronomical Union and an International Geophysical Union will be organized during the meeting at Brussels. It is planned to have these organizations take over the various international astronomical and geodetic committees which were in existence before the outbreak of the European war. Meetings of the American sections of these two unions were held at the National Research Council in Washington on June 23–25, at which the following delegates were selected: *Astronomical Union*, W. W. CAMPBELL, *Chairman*; W. S. ADAMS, S. I. BAILEY, BENJAMIN BOSS, W. S. EICHELBERGER, PHILIP FOX, W. J. HUMPHREYS, S. A. MITCHELL, F. R. MOULTON, H. N. RUSSELL, FRANK SCHLESINGER, C. E. ST. JOHN, F. H. SEARES, JOEL STEBBINS; *Geophysical Union*, WM. BOWIE, *Chairman*; L. A. BAUER, H. C. GRAVES, A. O. LEUSCHNER, G. W. LITTLEHALES, C. F. MARVIN, H. F. REID, EDWARD SIMPSON, J. T. WATKINS; Alternates: W. J. HUMPHREYS, J. F. HAYFORD, W. J. PETERS.

The provisional officers of the American sections of these two unions are as follows: Astronomical Union, W. W. CAMPBELL, *Chairman*; JOEL STEBBINS, *Secretary*; Geophysical Union, WILLIAM BOWIE, *Chairman*; H. O. WOOD, *Secretary*.

Conferences on the question of forming international organizations in

medicine, mathematics, geology, geography, biology, fisheries, and patents will be held in connection with the Brussels meetings.

The plan of voting suggested for the international council and the international unions is: One vote for nations having a population of less than five million; one vote additional for each additional five million of population or fraction thereof, except that nations having over twenty million have five votes only. The colonies of Great Britain will probably vote as separate nations.

THE TARIFF ON SCIENTIFIC SUPPLIES

Hearings were held on the three bills concerned with the tariff on chemical and optical glassware and scientific apparatus (H. R. 3734, 3735, and 4386) before the Committee on Ways and Means of the House of Representatives on June 11–13, 1919. Representative J. W. FORDNEY, of Michigan, Chairman of the Committee, presided. Among those who testified at the hearing were: representatives of the glass workers' unions; representatives of the manufacturers of chemical glassware, chemical porcelain, optical instruments, and scientific apparatus in general; and Dr. CHARLES H. HERTY, Editor of the Journal of Industrial and Engineering Chemistry, Dr. W. F. HILLEBRAND, of the Bureau of Standards, Mr. H. E. HOWE, of the National Research Council, Dr. CHARLES L. PARSONS, Secretary of the American Chemical Society, Lieut. Col. M. A. REASONER, of the Field Medical Supply Depot, U. S. A., Col. J. K. RUTHERFORD, Ordnance Dept., U. S. A., and Mr. F. J. SHERIDAN, of the U. S. Tariff Commission. Practically all the evidence was in favor of the removal of the duty-free importation privilege, and the imposition of whatever tariffs might be necessary to insure the establishment of the scientific apparatus and chemical glassware industries in the United States.

As these bills are of direct interest to all scientists and scientific institutions, the essential paragraphs of the bills are reproduced below:

H. R. 3734. (Introduced by Mr. BACHARACH, of New Jersey, on May 28, 1919.) A Bill to provide revenue for the Government and to establish and maintain the manufacture of optical glassware in the United States. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That on and after the day following the passage of this act, there shall be levied, collected, and paid upon the articles named herein when imported from any foreign country into the United States or any of its possessions, except the Philippine Islands and the islands of Guam and Tutuila, the rates of duties which are herein prescribed, namely: Glass plates or disks, rough cut or unwrought, for use in the manufacture of optical instruments, spectacles, and eyeglasses, suitable only for such use, as covered by paragraph 494 of the Tariff Act of October 3, 1913, 45 per centum ad valorem. And such articles and all scientific instruments in which such articles as enumerated in said paragraph 494 are used, shall not be entitled to free entry under paragraph 573 of the above mentioned act.

H. R. 3735. (Introduced by Mr. BACHARACH on May 28, 1919.) A Bill to provide revenue for the Government and to establish and maintain the manufacture of chemical glassware in the United States. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That on and after the day following the passage of this act there shall be levied, collected, and paid upon the articles named herein when imported from any foreign country into the United States or any of its possessions, except the Philippine Islands and the islands of Guam and Tutuila, the rates of duties herein prescribed, namely: Glasswares and porcelain wares used in the sciences, and in laboratories, or selected for laboratories of chemistry, physics, bacteriology, and biology, in their application to education, the industries, medicine, and the public health, including equipment for metallurgy, mineralogy, and testing of materials, and other similar uses, as covered by paragraphs 80 and 84 of the Tariff Act of October 3, 1913, 60 per centum ad valorem. And such articles shall not be entitled to free entry under paragraph 573 of the above-mentioned act.

H. R. 4386. (Introduced by Mr. MOTT on June 2, 1919.) A Bill to provide revenue for the Government and to establish and maintain the manufacture of philosophical, scientific, and laboratory apparatus in the United States. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That on and after the day following the passage of this act there shall be levied, collected, and paid upon the articles named herein, when imported from any foreign country into the United States or any of its possessions, except the Philippine Islands and the islands of Guam and Tutuila, the rates of duties which are herein prescribed, namely: Philosophical, scientific, and laboratory apparatus, utensils, and instruments, and parts thereof, finished or unfinished, 60 per centum ad valorem.

UNION OF SCIENTIFIC AND TECHNICAL WORKERS

The following resolution was adopted by the convention of the American Federation of Labor, held at Atlantic City during the week of June 16–21. The resolution was initiated by the (District of Columbia) Union of Federal Employees, with which the scientific and technical workers are now affiliated,[1] and was introduced into the convention jointly by the National Federation of Federal Employees and the American Federation of Teachers.

WHEREAS, Scientific research and the technical application of results of research form a fundamental basis upon which the development of our industries, manufacturing, agriculture, mining, and others must rest; and

WHEREAS, The productivity of industry is greatly increased by the technical application of the results of scientific research in physics, chemistry, biology and geology, in engineering and agriculture, and in

[1] See this JOURNAL 9: 303. May 19, 1919.

the related sciences; and the health and well-being not only of the workers but of the whole population as well, are dependent upon advances in medicine and sanitation; so that the value of scientific advancement to the welfare of the nation is many times greater than the cost of the necessary research; and

WHEREAS, The increased productivity of industry resulting from scientific research is a most potent factor in the ever-increasing struggle of the workers to raise their standards of living, and the importance of this factor must steadily increase since there is a limit beyond which the average standard of living of the whole population cannot progress by the usual methods of readjustment, which limit can only be raised by research and the utilization of the results of research in industry; and

WHEREAS, There are numerous important and pressing problems of administration and regulation now faced by federal, state, and local governments, the wise solution of which depends upon scientific and technical research; and

WHEREAS, The war has brought home to all the nations engaged in it the overwhelming importance of science and technology to national welfare, whether in war or in peace, and not only is private initiative attempting to organize far-reaching research in these fields on a national scale, but in several countries governmental participation and support of such undertakings are already active; therefore be it

RESOLVED, By the American Federation of Labor in convention assembled, that a broad program of scientific and technical research is of major importance to the national welfare and should be fostered in every way by the Federal Government, and that the activities of the Government itself in such research should be adequately and generously supported in order that the work may be greatly strengthened and extended; and the Secretary of the Federation is instructed to transmit copies of this resolution to the President of the United States, to the President *pro tempore* of the Senate, and to the Speaker of the House of Representatives.

NOTES

A "Fixed Nitrogen Research Laboratory" has been organized in the Nitrate Division of the Ordnance Department, with headquarters at the American University, in buildings formerly occupied by the Chemical Warfare Service. Lieut. Col. A. B. LAMB, of the Chemical Warfare Service, is director; Dr. R. C. TOLMAN, formerly of the Chemical Warfare Service, and Prof. W. C. BRAY, of the University of California, are associate directors; and Dr. H. A. CURTIS, formerly of the Nitrate Division, Ordnance Department, is executive officer. The work on the fixation of nitrogen carried on during the war in the Agricultural Department laboratories at Arlington, Virginia, the Geophysical Laboratory, and elsewhere, will be concentrated at the American University. In the absence of Col. Lamb in Europe, Dr. Tolman is acting director. At present the staff consists of fifty-five persons.

A series of deep-sea soundings off the southern Atlantic and Pacific coasts of the United States are provided for in the plans for all the Coast and Geodetic Survey steamers which are being sent this summer to the Pacific coast.

The offices of the National Research Council were removed on July 1 from 1023 Sixteenth Street to the building formerly occupied by the Navy League, at 1201 Sixteenth Street.

In the course of the survey of the Florida Reefs by the U. S. Coast and Geodetic steamer *Hydrographer* (C. H. OBER, commanding), an improved type of sounding tube has been tested during recent months in the deep waters of the Straits, with marked success.

Dr. GRAHAM EDGAR, formerly secretary of the Washington office of the Research Information Service, National Research Council, and lately with the Nitrate Division, has been appointed professor of chemistry at the University of Virginia.

Dr. W. S. EICHELBERGER, of the Naval Observatory, has been named as one of three American correspondents of the Bureau des Longitudes of France.

Mr. C. O. EWING has resigned from the Bureau of Chemistry to accept the position of assistant chief chemist with the United Drug Company (Liggett-Rexall) at Boston, Massachusetts.

Dr. L. J. GILLESPIE, chemist in the Bureau of Plant Industry, has been appointed professor of physical chemistry in Syracuse University, Syracuse, New York. He will assume the new position about September 1, 1919.

Mr. WILLIAM B. HEROY resigned from the Geological Survey on July 1, to accept a position on the editorial staff of the *Electrical World*, published by the McGraw-Hill Company, in New York City.

Mr. E. LESTER JONES, chief of the Coast and Geodetic Survey, has been given the degree of Master of Arts by Princeton University.

Director VAN H. MANNING, of the Bureau of Mines, received the honorary degree of Doctor of Engineering from the University of Pittsburgh in June.

Dr. S. W. STRATTON, director of the Bureau of Standards, was given the honorary degree of Doctor of Science by Yale University in June.

Major CLARENCE J. WEST, formerly of the Editorial Section, Chemical Warfare Service, will direct the newly-established Information Department of the laboratories of Arthur D. Little, Inc., Cambridge, Massachusetts.

Mr. R. R. WILLIAMS resigned from the Bureau of Chemistry, U. S. Department of Agriculture, in April and is now with the Melco Chemical Company, 52 Vanderbilt Avenue, New York City, manufacturers of isopropyl and other secondary alcohols and their derivatives, including acetone and various esters.

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